FINAL REPORT

EXECUTIVE SUMMARY

SR 95 Corridor Profile Study

Junction I-8 to Junction I-40

PREPARED FOR ADOT

MARCH 2017

ADOT WORK TASK NO.
MPD 041-15

ADOT CONTRACT NO.
11-013152

Prepared by

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SR 95 CORRIDOR PROFILE STUDY

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ARIZONA DEPARTMENT OF TRANSPORTATION

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EXECUTIVE SUMMARY

INTRODUCTION

The Arizona Department of Transportation (ADOT) is the lead agency for this Corridor Profile Study (CPS) of State Route 95 (SR 95) between Junction Interstate 8 (I-8) and Junction Interstate 40 (I-40). This study examines key performance measures relative to the SR 95 corridor, and the results of this performance evaluation are used to identify potential strategic improvements. The intent of the corridor profile program, and of ADOT's Planning-to-Programming (P2P) process, is to conduct performance-based planning to identify areas of need and make the most efficient use of available funding to provide an efficient transportation network.

ADOT is conducting eleven CPS within three separate groupings. The SR 95 corridor, depicted in **Figure ES-1**, is one of the strategic statewide corridors identified and the subject of this CPS.

Corridor Study Purpose, Goals, and Objectives

The purpose of the CPS is to measure corridor performance to inform the development of strategic solutions that are cost-effective and account for potential risks. This purpose can be accomplished by following the process described below:

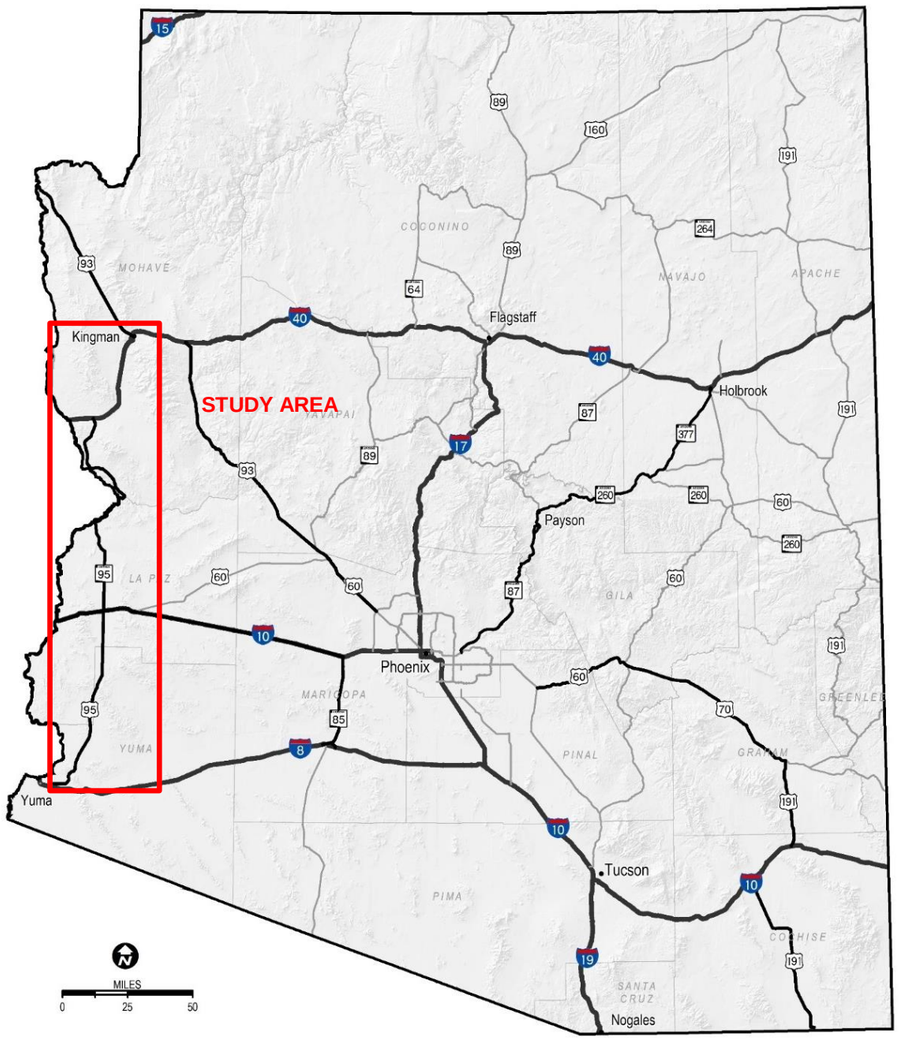
- Inventory past improvement recommendations
- Define corridor goals and objectives
- Assess existing performance based on quantifiable performance measures
- Propose various solutions to improve corridor performance
- Identify specific solutions that can provide quantifiable benefits relative to the performance measures
- Prioritize solutions for future implementation, accounting for performance effectiveness and risk analysis findings

The objective of this study is to identify a recommended set of prioritized potential solutions for consideration in future construction programs, derived from a transparent, defensible, logical, and replicable process. The SR 95 CPS defines solutions and improvements for the corridor that are evaluated and ranked to determine which investments offer the greatest benefit to the corridor in terms of enhancing performance.

The following goals are identified as the outcome of this study:

- Link project decision-making and investments on key corridors to strategic goals
- Develop solutions that address identified corridor needs based on measured performance
- Prioritize improvements that cost-effectively preserve, modernize, and expand transportation infrastructure

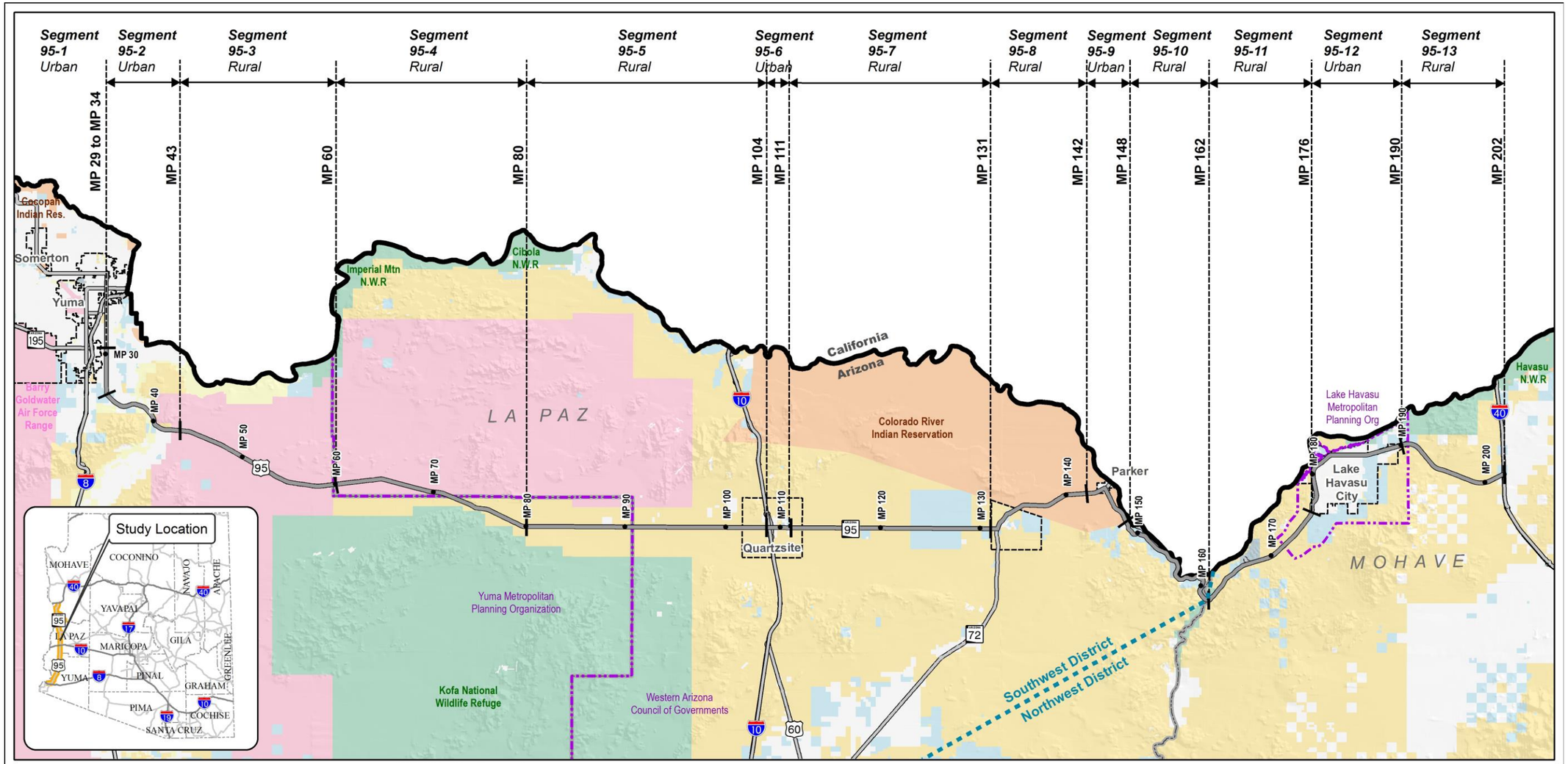
Figure ES-1: Corridor Study Area



Study Location and Corridor Segments

The SR 95 corridor is divided into 13 planning segments for analysis and evaluation. The corridor is segmented at logical breaks where the context changes due to differences in characteristics such as terrain, daily traffic volumes, or roadway typical sections. Corridor segments are shown in **Figure ES-2**.

Figure ES-2: Corridor Location and Segments



SR 95 Corridor Segments
Segment 95-1: West of Araby Road to East of Avenue 11E (MP 29 – 34)
Segment 95-2: East of Avenue 11E to South of Imperial Dam Road (MP 34 – 43)
Segment 95-3: South of Imperial Dam Road to Yuma Proving Ground Area (MP 43 – 60)
Segment 95-4: Yuma Proving Ground Area (MP 60 – 80)
Segment 95-5: Yuma Proving Ground Area to Quartzsite Area (MP 80 – 104)
Segment 95-6: Quartzsite Area (MP 104 – 111)
Segment 95-7: Quartzsite Area to SR 72 (MP 111 – 131)
Segment 95-8: SR 72 to Parker Area (MP 131 – 142)
Segment 95-9: Parker and Cienega Springs Area (MP 142 – 148)
Segment 95-10: Parker and Cienega Springs Area to the Bill Williams River (MP 148 – 162)
Segment 95-11: Bill Williams River to Lake Havasu City Area (MP 162 – 176)
Segment 95-12: Lake Havasu City Area (MP 176 – 190)
Segment 95-13: Lake Havasu City Area to I-40 (MP 190 – 202)

Corridor Segment
State_Boundary
County Boundary
Interstate/Highway
MPO/COG Boundary
ADOT District Boundary
City Boundary

Land Ownership
Bureau of Land Management
Bureau of Reclamation
U.S. Forest Service
State Game and Fish
Tribal Lands
Local or State Parks
Military
National Park Service
State Trust Land
U.S. Fish and Wildlife Service
Private

N
Miles
0 9 18

SR 95 Corridor Profile Study: I-8 to I-40
Project Vicinity and Segmentation

CORRIDOR PERFORMANCE

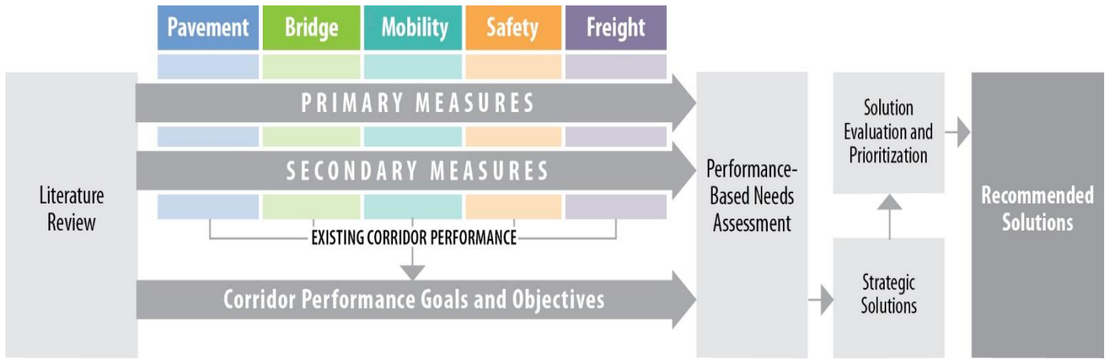
A series of performance measures is used to assess the SR 95 corridor. The results of the performance evaluation are used to define corridor needs relative to the long-term goals and objectives for the corridor.

Corridor Performance Framework

This study uses a performance-based process to define baseline corridor performance, diagnose corridor needs, develop corridor solutions, and prioritize strategic corridor investments. In support of this objective, a framework for the performance-based process was developed through a collaborative process involving ADOT and the CPS consultant teams.

Figure ES-3 illustrates the performance framework, which includes a two-tiered system of performance measures (primary and secondary) to evaluate baseline performance.

Figure ES-3: Corridor Profile Performance Framework



The following five performance areas guide the performance-based corridor analyses:

- Pavement
- Bridge
- Mobility
- Safety
- Freight

The performance measures include five primary measures: Pavement Index, Bridge Index, Mobility Index, Safety Index, and Freight Index. Additionally, a set of secondary performance measures provides for a more detailed analysis of corridor performance. **Table ES-1** provides the complete list of primary and secondary performance measures for each of the five performance areas.

Table ES-1: Corridor Performance Measures

Performance Area	Primary Measure	Secondary Measures
Pavement	**Pavement Index** Based on a combination of International Roughness Index and cracking	• Directional Pavement Serviceability • Pavement Failure • Pavement Hot Spots
Bridge	**Bridge Index** Based on lowest of deck, substructure, superstructure and structural evaluation rating	• Bridge Sufficiency • Functionally Obsolete Bridges • Bridge Rating • Bridge Hot Spots
Mobility	**Mobility Index** Based on combination of existing and future daily volume-to-capacity ratios	• Future Congestion • Peak Congestion • Travel Time Reliability • Multimodal Opportunities
Safety	**Safety Index** Based on frequency of fatal and incapacitating injury crashes	• Directional Safety Index • Strategic Highway Safety Plan Emphasis Areas • Crash Unit Types • Safety Hot Spots
Freight	**Freight Index** Based on bi-directional truck planning time index	• Recurring Delay • Non-Recurring Delay • Closure Duration • Bridge Vertical Clearance • Bridge Vertical Clearance Hot Spots

Each of the primary and secondary performance measures identified in the table above is comprised of one or more quantifiable indicators. A three-level scale was developed to standardize the performance scale across the five performance areas, with numerical thresholds specific to each performance measure:

Good/Above Average Performance – Rating is above the identified desirable/average range

Fair/Average Performance – Rating is within the identified desirable/average range

Poor/Below Average Performance – Rating is below the identified desirable/average range

The terms “good”, “fair”, and “poor” apply to the Pavement, Bridge, Mobility, and Freight performance measures, which have defined thresholds. The terms “above average”, “average”, and “below average” apply to the Safety performance measures, which have thresholds referenced to statewide averages.

Corridor Performance Summary

Table ES-2 shows a summary of corridor performance for all primary measures and secondary measure indicators for the SR 95 corridor. A weighted corridor average rating (based on the length of the segment) was calculated for each primary and secondary measure as shown in **Table ES-2**.

The following general observations were made related to the performance of the SR 95 corridor:

- **Overall Performance:** Within the five performance areas, the weighted average index for Pavement, Bridge, Mobility, and Safety show “good” or “fair” performance; Freight shows “poor” performance; Safety and Freight performance areas each show individual segments with “poor” ratings
- **Pavement Performance:** 157 of the 169 miles of the SR 95 corridor have “good” or “fair” performance for the overall Pavement Index; due to the significant area of pavement cracking, 3 of the 13 segments show “poor” performance for % Area Failure
- **Bridge Performance:** 14 bridges were evaluated; two bridges were identified as Bridge hot spots; these include Bouse Wash Bridge and Mockingbird Wash Bridge in Segments 95-8 and 95-12, respectively
- **Mobility Performance:** SR 95 is considered to have two operating environments for evaluating mobility performance: 2 or 3 Lane Undivided Highway and 4 or 5 Lane Undivided Highway; the Mobility Index weighted average indicates “good” overall mobility performance for the SR 95 corridor
- **Safety Performance:** Safety also utilizes the two operating environments for this analysis; the Safety Index weighted average indicates “above average” (good) overall safety performance for the SR 95 corridor; examining a five-year time-period, the were 24 fatal crashes and 135 incapacitating injury crashes
- **Freight Performance:** The Freight Index weighted average indicates “poor” performance for the SR 95 corridor, meaning the corridor has “poor” travel time reliability due to non-recurring congestion; there are no locations with vertical clearance less than 16.25 feet
- **Poorest Performing Segments:** Several segments show “poor” performance in multiple performance areas; these segments are 95-2 (Safety and Freight), 95-4 (Safety and Freight), 95-12 (Safety and Freight), and 95-13 (Pavement and Freight)
- **Highest Performing Segments:** Segments 95-3, 95-5, 95-6, 95-7 and 95-10 show “good” or “fair” performance for several performance measures

Table ES-2: Corridor Performance Summary by Segment and Performance Measure

Segment #	Segment Length (miles)	Pavement Performance Area				Bridge Performance Area				Mobility Performance Area											
		Pavement Index	Directional PSR		% Area Failure	Bridge Index	Sufficiency Rating	% of Deck Area on Functionally Obsolete Bridges	Lowest Bridge Rating	Mobility Index	Future Daily V/C	Existing Peak Hour V/C		Closure Extent (instances/ milepost/year/mile)		Directional TTI (all vehicles)		Directional PTI (all vehicles)		% Bicycle Accommodation	% Non-Single Occupancy Vehicle (SOV) Trips
			NB	SB								NB	SB	NB	SB	NB	SB	NB	SB		
95-1*[b1]	5	3.54	3.64		0.0%	6.00	80.87	0.0%	6	0.35	0.41	0.30	0.29	0.37	0.12	1.08	1.15	2.96	3.90	62%	18.6%
95-2^[a2]	9	3.86	3.78		0.0%	6.00	78.12	8.5%	6	0.42	0.50	0.41	0.41	0.16	0.02	1.05	1.00	2.21	1.14	56%	19.8%
95-3^[a2]	17	3.63	3.51		35.3%	5.00	68.22	0.0%	5	0.09	0.11	0.12	0.11	0.07	0.00	1.02	1.00	1.19	1.16	8%	19.8%
95-4^[a2]	20	4.41	4.28		0.0%	No Bridges				0.12	0.15	0.17	0.17	0.03	0.01	1.19	1.04	5.36	1.40	0%	5.0%
95-5^[a2]	24	4.14	4.12		0.0%	No Bridges				0.10	0.12	0.14	0.14	0.01	0.06	1.00	1.06	1.13	1.55	2%	23.0%
95-6*[b1]	2.5	3.27	3.23		33.3%	6.00	76.00	0.0%	6	0.13	0.17	0.15	0.15	0.00	0.08	1.48	1.31	7.75	5.42	87%	24.6%
95-7^[a2]	20	3.69	3.76		5.0%	6.00	79.00	0.0%	6	0.21	0.29	0.24	0.25	0.37	0.08	1.06	1.04	1.32	1.43	0%	14.6%
95-8^[a2]	11	3.49	3.27		9.1%	5.00	67.00	0.0%	5	0.45	0.61	0.36	0.36	0.04	0.27	1.00	1.00	1.71	1.37	25%	9.1%
95-9*[b1]	6	3.59	3.84		14.3%	6.76	80.86	0.0%	6	0.32	0.35	0.32	0.36	0.51	0.03	1.31	1.29	7.35	4.58	61%	11.4%
95-10^[a2]	14	3.66	3.59		0.0%	6.25	78.25	0.0%	6	0.36	0.40	0.33	0.33	0.18	0.16	1.06	1.00	1.28	1.15	2%	2.2%
95-11^[a2]	14	4.13	4.13		0.0%	No Bridges				0.27	0.30	0.24	0.23	0.17	0.29	1.08	1.05	1.36	1.61	0%	8.3%
95-12*[b1]	14	3.77	3.51	4.15	14.3%	5.46	76.82	20.2%	5	0.64	0.83	0.42	0.40	0.46	0.09	1.24	1.20	4.71	3.78	9%	18.1%
95-13^[a2]	12	2.77	3.77		24.7%	No Bridges				0.36	0.42	0.29	0.28	0.15	0.13	1.06	2.01	3.95	7.29	71%	14.3%
Weighted Corridor Average		3.79	3.80	3.86	8.7%	5.72	75.44	3.7%	5.57	0.27	0.33	0.25	0.25	0.17	0.10	1.09	1.13	2.66	2.24	17%	14.0%

SCALES

Performance Level	Non-Interstate			All				Urban and Fringe Urban	All	Uninterrupted		All	
Good/Above Average	> 3.50	> 3.50	< 5%	> 6.5	> 80	< 12%	> 6	< 0.71	< 0.22	< 1.15	< 1.3	> 90%	> 17%
Fair/Average	2.90 - 3.50	2.90 - 3.50	5% - 20%	5.0 - 6.5	50 - 80	12% - 40%	5 - 6	0.71 - 0.89	0.22 - 0.62	1.15 - 1.33	1.3 - 1.5	60% - 90%	11% - 17%
Poor/Below Average	< 2.90	< 2.90	> 20%	< 5.0	< 50	> 40%	< 5	> 0.89	> 0.62	> 1.33	> 1.5	< 60%	< 11%

Performance Level	Rural	Interrupted	
Good/Above Average	< 0.56	< 1.3	< 3.0
Fair/Average	0.56 - 0.76	1.3 - 2.0	3.0 - 6.0
Poor/Below Average	> 0.76	> 2.0	> 6.0

^Uninterrupted Flow Facility
*Interrupted Flow Facility
[a]2 or 3 Lane Undivided Highway
[b]4 or 5 Lane Undivided Highway
[1]Urban Operating Environment
[2]Rural Operating Environment

Table ES-2: Corridor Performance Summary by Segment and Performance Measure (continued)

Segment #	Segment Length (miles)	Safety Performance Area							Freight Performance Area							
		Safety Index	Directional Safety Index		% of Fatal + Incapacitating Injury Crashes Involving SHSP Top 5 Emphasis Areas Behaviors	% of Fatal + Incapacitating Injury Crashes Involving Trucks	% of Fatal + Incapacitating Injury Crashes Involving Motorcycles	% of Fatal + Incapacitating Injury Crashes Involving Non-Motorized Travelers	Freight Index	Directional TTTI		Directional TPTI		Closure Duration (minutes/milepost/year/mile)		Bridge Vertical Clearance (feet)
			NB	SB						NB	SB	NB	SB	NB	SB	
95-1*[b1]	5	1.30	1.29	1.31	17%	Insufficient Data	Insufficient Data	Insufficient Data	0.29	1.12	1.19	3.58	3.32	117.61	14.88	No UP
95-2^[a2]	8	1.29	2.42	0.16	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.62	1.08	1.00	2.03	1.17	27.89	3.62	No UP
95-3^[a2]	18	0.07	Insufficient Data	0.00	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.79	1.03	1.03	1.25	1.28	28.05	0.00	No UP
95-4^[a2]	20	1.48	2.00	0.95	20%	Insufficient Data	Insufficient Data	Insufficient Data	0.13	1.28	1.11	13.66	1.52	10.18	2.19	No UP
95-5^[a2]	24	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.72	1.04	1.11	1.13	1.65	2.68	7.13	No UP
95-6*[b1]	2.5	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.29	1.62	1.44	3.23	3.62	0.00	46.96	No UP
95-7^[a2]	20	0.00	0.00	0.00	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.68	1.10	1.09	1.46	1.50	133.60	7.49	No UP
95-8^[a2]	11	0.14	0.28	0.00	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.55	1.04	1.02	2.22	1.44	10.13	166.29	No UP
95-9*[b1]	6	1.10	2.13	0.07	17%	Insufficient Data	Insufficient Data	Insufficient Data	0.18	1.41	1.33	7.04	4.27	106.46	22.77	27.83
95-10^[a2]	14	0.62	0.28	0.96	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data	0.79	1.10	1.00	1.41	1.13	39.55	33.24	No UP
95-11^[a2]	14	1.91	1.89	1.93	64%	Insufficient Data	Insufficient Data	Insufficient Data	0.64	1.18	1.10	1.56	1.55	27.94	53.85	No UP
95-12*[b1]	14	1.77	1.63	1.91	45%	Insufficient Data	Insufficient Data	Insufficient Data	0.22	1.32	1.28	5.29	3.96	67.30	11.80	16.41
95-13^[a2]	12	1.06	1.88	0.24	44%	Insufficient Data	Insufficient Data	Insufficient Data	0.19	1.31	2.74	3.09	7.66	18.23	20.92	No UP
Weighted Corridor Average		0.91	1.28	0.69	37%	Insufficient Data	Insufficient Data	Insufficient Data	0.52	1.16	1.22	3.65	2.28	42.21	24.87	22.12

SCALES

Performance Level	2 or 3 Lane Undivided Highway					Uninterrupted			All	
Good/Above Average	< 0.94	< 51%	< 4%	< 16%	< 2%	> 0.77	< 1.15	< 1.3	< 44.18	> 16.5
Fair/Average	0.94 - 1.06	51% - 57%	4% - 7%	16% - 25%	2% - 4%	0.67 - 0.77	1.15 - 1.33	1.3 - 1.5	44.18 - 124.86	16.0-16.5
Poor/Below Average	> 1.06	> 57%	> 7%	> 25%	> 4%	< 0.67	> 1.33	> 1.5	> 124.86	< 16.0
Performance Level	**4 or 5 Lane Undivided Highway**					**Interrupted**				
Good/Above Average	< 0.80	< 42%	< 6%	< 6%	< 5%	> 0.33	< 1.3	< 3.0		
Fair/Average	0.80 - 1.20	42% - 51%	6% - 10%	6% - 9%	5% - 8%	0.17 - 0.33	1.3 - 2.0	3.0 - 6.0		
Poor/Below Average	> 1.20	> 51%	> 10%	> 9%	> 8%	< 0.17	> 2.0	> 6.0		

^Uninterrupted Flow Facility [a]2 or 3 Lane Undivided Highway [1]Urban Operating Environment
*Interrupted Flow Facility [b]4 or 5 Lane Undivided Highway [2]Rural Operating Environment

Notes: "Insufficient Data" indicates there was not enough data available to generate reliable performance ratings

"No UP" indicates no underpasses are present in the segment

NEEDS ASSESSMENT

Corridor Description

The SR 95 corridor is an important north-south travel corridor linking western Arizona communities. The corridor, which serves agricultural, military, recreational, tourist, and regional traffic, provides critical connections between communities and to regional and interstate highways.

The critical nature of the facility is magnified when crashes or rainfall events close the road for any length of time as alternate routes are limited.

Corridor Objectives

The ADOT Long-Range Transportation Plan (LRTP), 2010-2035 established Statewide performance goals. These goals were reviewed, and those relevant to SR 95 performance areas were identified. SR 95 corridor goals were then formulated for each of the five performance areas. Based on stakeholder input and performance results, three "emphasis areas" were identified for the SR 95 corridor: Mobility, Safety, and Freight.

Performance objectives were developed that identify the desired level of performance, based on the performance scale levels, for the overall corridor and for each corridor segment. For each performance "emphasis areas", the corridor-wide weighted average performance objectives are identified with a higher standard than for the other performance areas; that is, for the three areas designated as corridor emphasis areas, the performance areas had a higher performance goal.

Achieving corridor and segment performance objectives will require investments to be targeted toward improvements that support the safe and efficient movement of travelers on the corridor.

Needs Assessment Process

The performance-based needs assessment process is illustrated in **Figure ES-4**.

Corridor needs represent the gap between baseline performance and the established performance objectives. Corridor needs are identified by mathematically comparing corridor baseline corridor performance against corridor and segment objectives for each of the five performance areas used to characterize the health of the corridor: Pavement, Bridge, Mobility, Safety, and Freight.

The comparison provides a starting point for the identification of performance needs. This mathematical comparison results in an initial need rating of None, Low, Medium, or High for each primary and secondary performance measure. An illustrative example of this process is shown in **Figure ES-5**.

The initial level of need for each segment is refined to account for hot spots and recently completed or under construction projects, resulting in a final level of need for each segment. The final levels of need for each primary and secondary performance measure are combined to produce a weighted final need rating for each segment. A detailed review of available data helps identify contributing factors to the need and if there is a high level of historical investment.

Figure ES-4: Needs Assessment Process

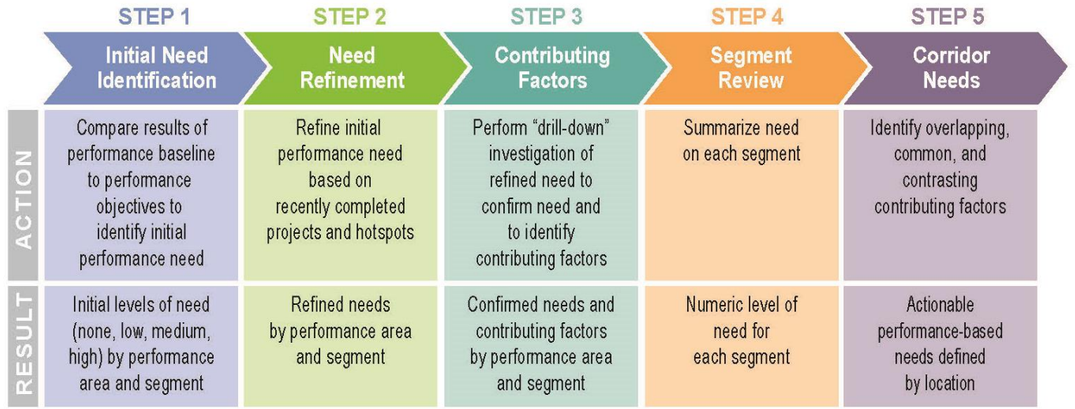


Figure ES-5: Initial Need Ratings in Relation to Baseline Performance (Bridge Example)

Performance Thresholds	Performance Level	Initial Level of Need	Description
6.5	Good	None*	All levels of Good and top 1/3 of Fair (>6.0)
	Good		
	Good		
	Fair		
	Fair	Low	Middle 1/3 of Fair (5.5-6.0)
5.0	Fair	Medium	Lower 1/3 of Fair and top 1/3 of Poor (4.5-5.5)
	Poor		
	Poor	High	Lower 2/3 of Poor (<4.5)
	Poor		

**A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study.*

Summary of Needs

Table ES-3 provides a summary of needs for each segment across all performance areas, with the average need score for each segment presented in the last row of the table. A weighting factor of 1.5 is applied to the need scores of the performance areas identified as emphasis areas (Mobility, Safety, and Freight for the SR 95 corridor).

On SR 95, there are no segments with a High average need; eight segments resulted in a Medium average need, and five segments resulted in a Low average need. More information on the identified final needs in each performance area is provided below.

Pavement Needs

- Seven segments (95-3, 6, 7, 8, 9, 12, and 13) contain Pavement hot spots, but two of these segments had recent paving projects that addressed the needs
- Segments 95-6, 7, 8, 9, and 12 have final needs of Low; all other segments of the corridor have a final Pavement need of None
- Segments 95-7, 9, 12, and 13 show a high level of historical investment, meaning that some previous projects have proven to provide only temporary improvements and require frequent attention

Bridge Needs

- Three segments have a Medium Bridge final level of need (95-3, 8, and 12)
- Segment 95-8 and 95-12 have bridges that have Medium needs as well as being identified in the historical review, meaning the bridges may have a repetitive investment issue
- Bridge needs exist at three of the thirteen bridges present on the corridor

Mobility Needs

- Low Mobility needs exist on all thirteen segments of the corridor
- A majority of the Mobility needs are related to future travel demand, directional TTI and PTI issues, and the frequency of closures along the corridor
- Bicycle accommodation needs are High on eight of the thirteen segments of the corridor

Safety Needs

- High Safety needs exist on four of the thirteen corridor segments
- Safety hot spots exist only in Segment 95-12 at MP 179-190
- At the overall corridor level, 70% of the fatal and incapacitating crashes involve a collision with motor vehicle, 24% involve single vehicles, and 20% involve disregarded traffic signal
- A High level of need exists on Segments 95-2, 4, 11, and 12; there are no programmed projects expected to address the identified Safety needs
- A Medium level of need exists on Segments 95-1 and 95-9; there are no programmed projects expected to address the identified Safety needs
- Two of the segments of the corridor (95-5 and 95-6) contain insufficient data (insufficient number of crashes to draw statistical conclusions) to determine a level of need, so a need value is not available (N/A)

Freight Needs

- Twelve of 13 segments of the SR 95 corridor exhibit needs in Freight Performance; bridge needs exist at three of the nine bridges; segment 95-3 did not exhibit a freight need
- The following 8 segments exhibit Medium or High levels of need: 95-2, 4, 7, 8, 9, 11, 12, and 13

Overlapping Needs

Corridor segments with overlapping performance needs on SR 95 were identified to inform identification of strategic solutions that address more than one performance area with elevated levels of need. Implementing projects that address multiple needs more effectively improves overall segment and corridor performance. Locations with elevated levels of overlapping need are:

- MP 131-148 (Segments 95-8 and 9) and MP 176-190 (Segment 95-12) have overlapping needs in at least four performance areas; these segments include the Bouse Wash Bridge, Mockingbird Wash Bridge, and McCulloch Boulevard Underpass; low travel time reliability and road closures impact Mobility and Freight performance; Safety needs are attributable to angled and left-turn crashes, especially within MP 142-148 (Segment 95-9)
- MP 104-131 (Segments 95-6 and 7) have overlapping needs in the Pavement, Mobility, and Freight performance areas; Mobility and Freight performance areas are impacted by roadway closures and low travel time reliability
- MP 29-43 (Segment 95-1 and 2), MP 60-80 (Segment 95-4), MP 162-176 (Segment 95-11), and MP 190-202 (Segment 95-13) have overlapping needs in the Mobility, Safety, and Freight performance areas; Safety needs are attributable to access/intersection incidents; Mobility and Freight performance areas are impacted by roadway closures and low travel time reliability
- MP 80-104 (Segment 95-5) and MP 148-162 (MP 95-10) have overlapping needs in the Mobility and Freight performance areas; Mobility and Freight are impacted by roadway closures and low travel time reliability

Table ES-3: Summary of Needs by Segment

Performance Area	Segment Number and Mileposts (MP)												
	95-1	95-2	95-3	95-4	95-5	95-6	95-7	95-8	95-9	95-10	95-11	95-12	95-13
	MP 29-34	MP 34-43	MP 43-60	MP 60-80	MP 80-104	MP 104-111	MP 111-131	MP 131-142	MP 142-148	MP 148-162	MP 162-176	MP 176-190	MP 190-202
Pavement	None	None	None	None	None	Low	Low	Low	Low	None	None	Low	None
Bridge	None	None	Medium	None	None	None	None	Medium	None	None	None	Medium	None
Mobility+	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Safety+	Medium	High	None	High	N/A#	N/A	None	None	Medium	None	High	High	Low
Freight+	Low	High	None	High	Low	Low	High	High	High	Low	Medium	Medium	High
Average Need	**0.92**	**1.62**	**0.54**	**1.62**	**0.60**	**0.80**	**1.08**	**1.38**	**1.54**	**0.46**	**1.38**	**1.85**	**1.15**

** A segment need rating of 'None' does not indicate a lack of needed improvements; rather, it indicates that the segment performance score exceeds the established performance thresholds and strategic solutions for that segment will not be developed as part of this study*

+ Identified as an emphasis area for the SR 95 corridor

 # N/A indicates insufficient or no data available to determine level of need

Average Need Scale	
None*	< 0.1
Low	0.1 - 1.0
Medium	1.0 - 2.0
High	> 2.0

STRATEGIC SOLUTIONS

The principal objective of the CPS is to identify strategic solutions (investments) that are performance-based to ensure that available funding resources are used to maximize the performance of the State's key transportation corridors. A first step in the development of strategic solutions is to identify areas of elevated levels of need, as addressing these needs will have the greatest effect on corridor performance. Segments with Medium or High needs and specific locations of hot spots are considered strategic investment areas for which strategic solutions should be developed. Segments with lower levels of need or without identified hot spots are not considered candidates for strategic investment and are expected to be addressed through other ADOT programming processes. The SR 95 strategic investment areas (resulting from the elevated needs) are shown in **Figure ES-6**.

Screening Process

In some cases, needs that are identified do not advance to solutions development and are screened from further consideration because they have been or will be addressed through other measures including:

- A project is programmed to address this need
- The need is a result of a Pavement or Bridge hot spot that does not show historical investment or rating issues; these hot spots will likely be addressed through other ADOT programming means
- A bridge is not a hot spot but is located within a segment with a Medium or High level of need; this bridge will likely be addressed through current ADOT bridge maintenance and preservation programming processes
- The need is determined to be non-actionable (i.e., cannot be addressed through an ADOT project)
- The conditions/characteristics of the location have changed since the performance data was collected that was used to identify the need

Candidate Solutions

Documented performance needs serve as the foundation for developing candidate solutions for corridor preservation, modernization, and expansion. For each elevated need within a strategic investment area that is not screened out, a candidate solution is developed to address the identified need. Each candidate solution is assigned to one of the following three P2P investment categories based on the scope of the solution:

- Preservation
- Modernization
- Expansion

Candidate solutions are not intended to be a substitute or replacement for traditional ADOT project development processes where various ADOT technical groups and districts develop candidate projects for consideration in the performance-based programming in the P2P process. Rather, these candidate solutions are intended to complement ADOT's traditional project development processes through a performance-based process to address needs in one or more of the five performance areas of Pavement, Bridge, Mobility, Safety, and Freight. Candidate solutions developed for the SR 95 corridor will be considered along with other candidate projects in the ADOT statewide programming process.

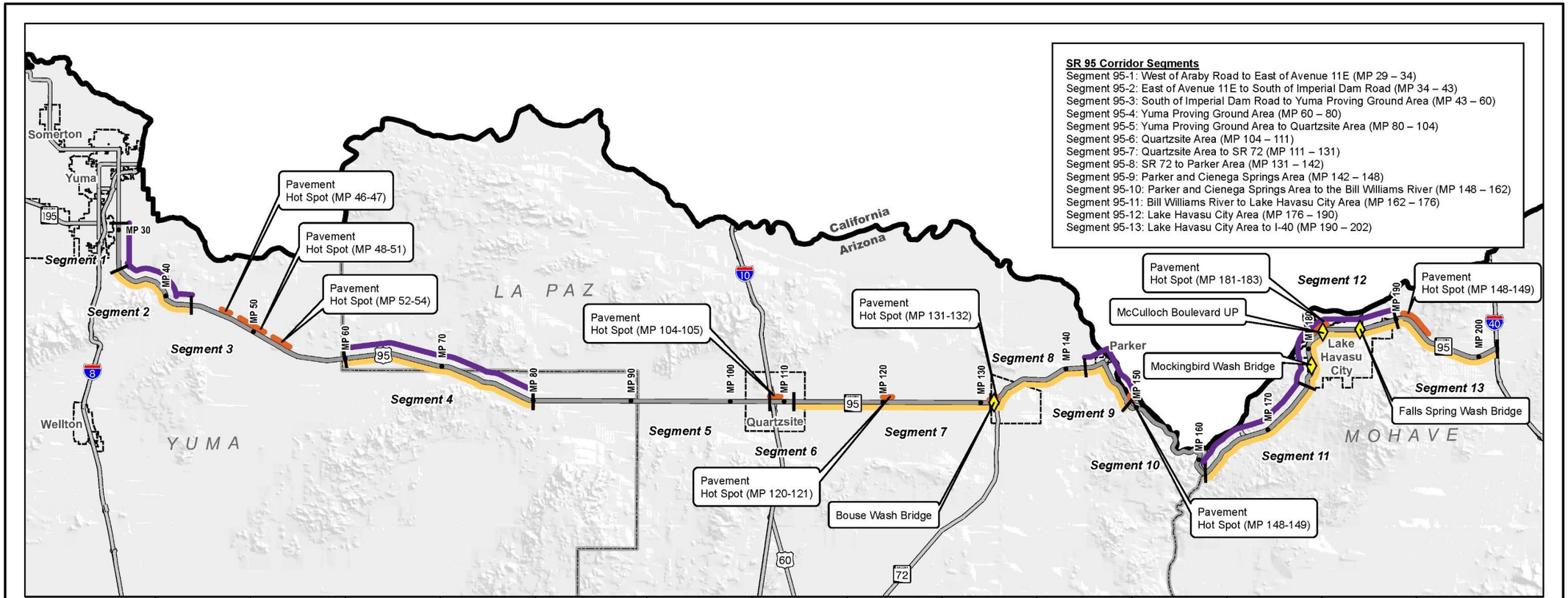
Candidate solutions should include some or all of the following characteristics:

- Do not recreate or replace results from normal programming processes
- May include programs or initiatives, areas for further study, and infrastructure projects
- Address elevated levels of need (High or Medium) and hot spots
- Focus on investments in modernization projects (to optimize current infrastructure)
- Address overlapping needs
- Reduce costly repetitive maintenance
- Extend operational life of system and delay expansion
- Leverage programmed projects that can be expanded to address other strategic elements
- Provide measurable benefit

Candidate solutions developed to address an elevated need in the Pavement or Bridge performance areas include two options; rehabilitation or full replacement. These solutions are initially evaluated through a Life-Cycle Cost Analysis (LCCA) to provide insights into the cost-effectiveness of these options so a recommended approach can be identified. Candidate solutions developed to address an elevated need in the Mobility, Safety, or Freight performance areas are advanced directly to the Performance Effectiveness Evaluation. In some cases, there may be multiple solutions identified to address the same area of need.

Candidate solutions that are recommended to expand or modify the scope of an already programmed project are noted and are not advanced to solution evaluation and prioritization. These solutions are directly recommended for programming.

Figure ES-6: Strategic Investment Areas



Performance Areas	95-1	95-2	95-3	95-4	95-5	95-6	95-7	95-8	95-9	95-10	95-11	95-12	95-13	Performance Areas
	MP 29-34	MP 34-43	MP 43-60	MP 60-80	MP 80-104	MP 104-111	MP 111-131	MP 131-142	MP 142-148	MP 148-162	MP 162-176	MP 176-190	MP 190-202	
Pavement	-	-	Hot Spot	-	-	Hot Spot	Hot Spot	Hot Spot	Hot Spot	-	-	Hot Spot	Hot Spot	Pavement
Bridge	-	-	Medium	-	-	-	-	Medium	-	-	-	Medium	-	Bridge
Mobility*	-	-	-	-	-	-	-	-	-	-	-	-	-	Mobility*
Safety*	Medium	High	-	High	-	-	-	-	Medium	-	High	High	-	Safety*
Freight*	-	High	-	High	-	-	High	High	High	-	Medium	Medium	High	Freight*

** Identified as emphasis area for SR-95 Corridor*
Note:Figure shows strategic investment areas, which are segments with Medium and High levels of need an locations of hot spots. A "-" symbol indicates a segment level of need of Low or None, which is not considered strategic.

SR 95 Corridor Profile Study: I-8 to I-40
Strategic Investment Areas

SOLUTION EVALUATION AND PRIORITIZATION

Candidate solutions are evaluated using the following steps: LCCA (where applicable), Performance Effectiveness Evaluation, Solution Risk Analysis, and Candidate Solution Prioritization. The methodology and approach to this evaluation are shown in **Figure ES-7** and described more fully below.

Life-Cycle Cost Analysis

All Pavement and Bridge candidate solutions have two options: rehabilitation/repair or reconstruction. These options are evaluated through an LCCA to determine the best approach for each location where a Pavement or Bridge solution is recommended. The LCCA can eliminate options from further consideration and identify which options should be carried forward for further evaluation.

All Mobility, Safety, and Freight strategic investment areas that result in multiple independent candidate solutions are advanced directly to the Performance Effectiveness Evaluation.

Performance Effectiveness Evaluation

After completing the LCCA process, all remaining candidate solutions are evaluated based on their performance effectiveness. This process includes determining a Performance Effectiveness Score (PES) based on how much each solution impacts the existing performance and needs scores for each segment. This evaluation also includes a Performance Area Risk Analysis to help differentiate between similar solutions based on factors that are not directly addressed in the performance system.

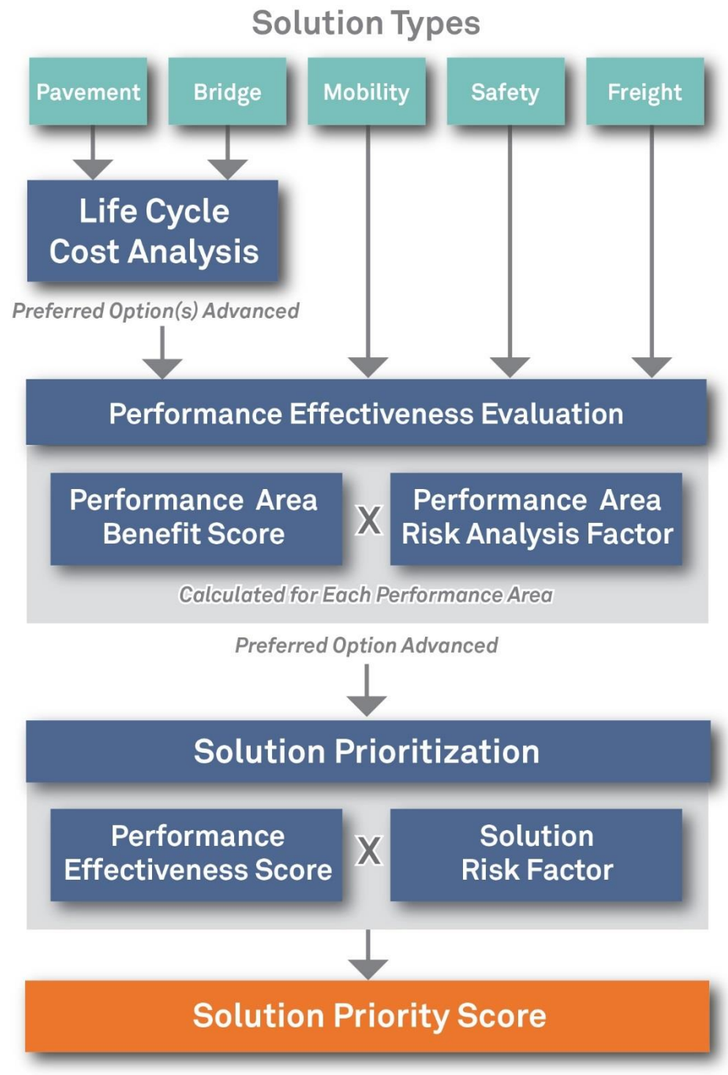
Solution Risk Analysis

All candidate solutions advanced through the Performance Effectiveness Evaluation are also evaluated through a Solution Risk Analysis process. A solution risk probability and consequence analysis is conducted to develop a solution-level risk weighting factor. This risk analysis is a numeric scoring system to help address the risk of not implementing a solution based on the likelihood and severity of performance failure.

Candidate Solution Prioritization

The PES, weighted risk factor, and segment average need score are combined to create a prioritization score. The candidate solutions are ranked by prioritization score from highest to lowest. The highest prioritization score indicates the candidate solution that is recommended as the highest priority. Solutions that address multiple performance areas tend to score higher in this process.

Figure ES-7: Candidate Solution Evaluation Process



SUMMARY OF CORRIDOR RECOMMENDATIONS

Prioritized Candidate Solution Recommendations

Table ES-4 and **Figure ES-8** show the prioritized candidate solutions recommended for the SR 95 corridor. The purpose of these solutions is to improve performance of the SR 95 corridor, primarily in the Mobility, Safety, and Freight performance areas. The highest priority solutions address needs in the Lake Havasu City area (MP 177-186) and Dome Valley area (MP 39-42).

Other Corridor Recommendations

As part of the investigation of strategic investment areas and candidate solutions, other corridor recommendations were also identified. These recommendations identify areas for further study, and other corridor-specific recommendations that are not related to construction or policy. The SR 95 other corridor recommendations are:

- Conduct a feasibility study for installing automated flood warning system in areas prone to flooding
- Coordinate with the Lake Havasu Strategic Transportation Safety Plan to identify safety improvements and programs to reduce crashes on SR 95 in Lake Havasu City
- Coordinate with the Western Arizona Council of Governments (WACOG) Strategic Transportation Safety Plan to identify safety improvements and programs to reduce crashes on SR 95 in Mohave County and La Paz County
- Investigate feasibility of advanced warning and alternate routing system during roadway closure events such as flash flooding and other incidents to improve resiliency and emergency response

Policy and Initiative Recommendations

In addition to location-specific needs, general corridor and system-wide needs were identified through the CPS process. While these needs are overarching, and cannot be individually evaluated through the CPS process, it is important to document them. A list of recommended policies and initiatives was developed for consideration when programming future projects not only on SR 95, but across the entire state highway system where conditions are applicable. The following list, which is in no order of priority, was derived from the Round 1, Round 2, and Round 3 CPS:

- Install Intelligent Transportation System (ITS) conduit with all new infrastructure projects
- Prepare strategic plans for Closed Circuit Television (CCTV) camera and Road Weather Information System (RWIS) locations statewide
- Leverage power and communication at existing weigh-in-motion (WIM), dynamic messaging signs (DMS), and call box locations to expand ITS applications across the state
- Consider solar power for lighting and ITS where applicable
- Investigate ice formation prediction technology where applicable
- Conduct highway safety manual evaluation for all future programmed projects
- Develop infrastructure maintenance and preservation plans (including schedule and funding) for all pavement and bridge infrastructure replacement or expansion projects
- Develop standardized bridge maintenance procedures so districts can do routine maintenance work
- Review historical ratings and level of previous investment during scoping of pavement and bridge projects; in pavement locations that warrant further investigation, conduct subsurface investigations during project scoping to determine if full replacement is warranted
- For pavement rehabilitation projects, enhance the amount/level of geotechnical investigations to address issues specific to the varying conditions along the project
- Expand programmed and future pavement projects as necessary to include shoulders
- Expand median cable barrier guidelines to account for safety performance
- Install CCTV cameras with all DMS
- In locations with limited communications, use CCTV cameras to provide still images rather than streaming video
- Develop statewide program for pavement replacement
- Install additional continuous permanent count stations along strategic corridors to enhance traffic count data
- When reconstruction or rehabilitation activities will affect existing bridge vertical clearance, the dimension of the new bridge vertical clearance should be a minimum of 16.25 feet where feasible
- All new or reconstructed roadway/shoulder edges adjacent to an unpaved surface should be constructed with a Safety Edge
- Collision data on tribal lands may be incomplete or inconsistent; additional coordination for data on tribal lands is recommended to ensure adequate reflection of safety issues
- Expand data collection devices statewide to measure freight delay
- Evaluate and accommodate potential changes in freight and goods movement trends that may result from improvements and expansions to the state roadway network

Next Steps

Candidate solutions developed for the SR 95 corridor will be considered along with other candidate projects in the ADOT statewide programming process. It is important to note that candidate solutions are intended to represent strategic solutions to address existing performance needs related to the Pavement, Bridge, Mobility, Safety, and Freight performance areas. Therefore, the strategic solutions are not intended to preclude recommendations related to the ultimate vision for the corridor that may have been defined in the context of prior planning studies and/or design concept reports. Recommendations from such studies are still relevant to addressing the ultimate corridor objectives. Upon completion of all three CPS rounds, the results will be incorporated into a summary document comparing all corridors that is expected to provide a performance-based review of statewide needs and candidate solutions.

Table ES-4: Prioritized Recommended Solutions

Rank	Candidate Solution #	Option	Solution Name and Location	Description / Scope	Estimated Cost (in millions)	Investment Category (Preservation [P], Modernization [M], Expansion [E])	Prioritization Score
1	CS95.13	B	Lake Havasu City Safety and Freight Improvements (MP 177-190)	Construct southbound right turn lanes at Smoketree Ave, Swanson Ave, W Acoma Blvd, Lake Dry; install raised median throughout City limits (MP 177 – MP 186); implement signal coordination/adjust timing; mitigate differential settling on Falls Spring Wash Bridge (MP 186.2)	$13.45	M	98
		A	*Lake Havasu City Safety and Freight Improvements (MP 177-190)*	*Reconstruct 9 signalized intersections as double lane roundabouts (Mulberry Ave, Smoketree Ave, Swanson Ave, Mesquite Ave, Palo Verde Blvd S, Industrial Blvd, W Acoma Blvd, Kiowa Blvd N, Palo Verde Blvd N); install raised median throughout City limits (MP 177 – MP 186); mitigate differential settling on Falls Spring Wash Bridge (MP 186.2)*	*$51.33*	*M*	*62*
2	CS95.3	-	Dome Valley Area Safety Improvements (MP 39-42)	Widen shoulders (NB/SB); install chevrons at horizontal curve from MP 40.1 to 40.4; install warning signs for intersections with Adair Park Rd (MP 39.7) and County 3rd St (MP 40.5)	$3.34	M	79
3	CS95.16	-	Lake Havasu City to I-40 Freight Improvements (MP 194-198)	Widen shoulders (NB/SB) MP 194.5 – MP 196.0; construct alternating passing lanes MP 196 – MP 198	$9.63	M	78
4	CS95.2	-	Fortuna Wash Area Safety Improvements (MP 35-39)	Install two-way center turn lane (expand from a 2-lane undivided highway to a 5-lane highway); widen bridge over canal Welton Mohawk Canal Bridge (MP 38.0)	$17.17	M/E	75
5	CS95.12	-	Bill Williams River Bridge to Lake Havasu City Safety and Freight Improvements (MP 162-176)	Widen shoulders in both the northbound and southbound direction(NB/SB); construct alternating passing lanes at MP 172.8 – MP 177 and MP 164 – MP 169.8; install curve warning signs, advisory speed sign and chevrons at MP 162.3	$54.35	M	71
6	CS95.10	-	Parker Safety and Freight Improvements (MP 142-150)	Construct right turn lanes at Riverside Drive (MP 148.3, NB and SB), Cove Avenue (MP 148.2, NB and SB), Ironwood Road (MP 147.5, SB), and Mesquite Drive (MP 147.3, SB); Improve signal visibility and install warning signs and transverse rumble strips north of Resort Drive to alert southbound traffic	$2.85	M	61
7	CS95.9	A	Bouse Wash to Parker Freight Improvements (MP 131-142)	Widen shoulders (NB/SB); construct drainage structure and re-profile roadway at MP 134.4	$14.76	M	59
8	CS95.1	-	Yuma Area Safety Improvements (MP 29-34)	Install two-way center turn lane (MP 29 – 32 expands from a 4-lane undivided highway to a 5-lane undivided highway, MP 32 – 34 expands from a 2-lane undivided highway to a 5-lane undivided highway); install raised medians at signalized intersection approaches (approximately 250' on each approach); improve signal visibility and install warning signs at the following intersections: Araby Road (MP 29.4), Avenue 7E (MP 29.9), Avenue 8E (MP 30.9), Avenue 11E (MP 33.7); widen Gila Canal Bridge (MP 33.55)	$15.41	M/E	54
9	CS95.4	A	Yuma Proving Ground Area Safety and Freight Improvements (MP 59-80)	Widen shoulders (NB/SB)	$30.39	M	52
		B	*Yuma Proving Ground Area Safety and Freight Improvements (MP 59-80)*	*Construct alternating passing lanes*	*$78.31*	*M*	*24*
10	CS95.6	-	Quartzsite to Bouse Wash Freight Improvements (MP 111-131)	Widen shoulders (NB/SB); Construct drainage structures and re-profile roadway at 19 locations with flooding potential: MP 110.8, 112.8, 113.1, 114.9, 115.1, 116.2, 116.6 are higher priority with upstream channelization concentrating flows; MP 117.1, 117.7, 118.9, 119.6, 119.8, 120.1, 120.6, 120.8, 121.4, 122.1, 122.3, 122.6 are additional locations	$51.85	M	29
11	CS95.5	-	Yuma Proving Ground Freight Improvements (MP 59-71)	Construct drainage structures and re-profile roadway at 10 locations where flows are concentrated by upstream channelization (MP 59 – MP 60 three crossings, MP 61.0, MP 62.4, MP 66.0, MP 66.8, MP 69.1-69.3 two crossings, MP 71.3)	$10.74	M	12
12	CS95.17	-	I-40 Approach Freight Improvements (MP 201-202)	Construct auxiliary lanes to create a 5-lane section through activity center (MP 201.3 – MP 202); install signs prohibiting left turns in/out of the northern Wendy's/Pilot driveway	$3.16	E	8

"-" no options for the candidate solution

Figure ES-8: Prioritized Recommended Solutions